CELTIC-NEXT
∑eureka Cluster

Project Information

6G Smart

6G-SMART

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Allebsmart Lda, Portugal

Celfinet, Portugal

Future Connections, Spain

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Instituto Superior de Engenharia do Porto (ISEP/CISTER), Portugal

Manufacturing Technology Centre (MTC), UK

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www.celticnext.eu/project-6g-smart

6G Self Organising and Managing Open Radio Access Networks

6G-SMART addresses the growing complexity of mobile networks by developing intelligent self-organising solutions for Open RAN using AI/ML technologies. The project aims to coordinate multiple ML algorithms through a unified orchestration platform to deliver scalable and efficient network automation. Real-world testing will be conducted in private telecom and smart factory environments.

Main focus

6G-SMART addresses critical challenges in deploying intelligent and automated solutions for mobile networks, specifically in Open RAN environments. Current solutions often apply individual ML models to optimise specific network functions, but this leads to conflicting decisions when multiple models operate simultaneously. Figure 1 illustrates the architecture of 6G-SMART and its components. As can be seen, the project introduces a novel ML orchestrator capable of coordinating and harmonising decisions across different models, thus avoiding suboptimal or contradictory outcomes. It also proposes a unified Machine Learning Convergence (MLC) platform that abstracts hardware dependencies and ensures portability of AI solutions across different O-RAN-compliant infrastructures. The project will focus on enabling self-configuration, self-optimisation, and self-healing functions to support fully automated and adaptive 6G RANs. By facilitating collaboration between academia and industry, 6G-SMART aims to deliver innovative, real-world-tested solutions that improve energy efficiency, reliability, and service agility while reducing operational complexity and costs. It is a major step toward achieving the vision of autonomous and intelligent 6G networks.

Approach

The 6G-SMART project adopts a modular and layered approach to develop a scalable and intelligent self-organising network solution based on Open RAN. It begins by designing standalone AI/ML models to implement key self-x functions: self-configuration for automated setup, self-optimisation for performance tuning, and self-healing for proactive fault recovery. These models will be implemented as modular software components, or xApps/rApps, compatible with the RAN Intelligent Controller (RIC) in O-RAN architecture.

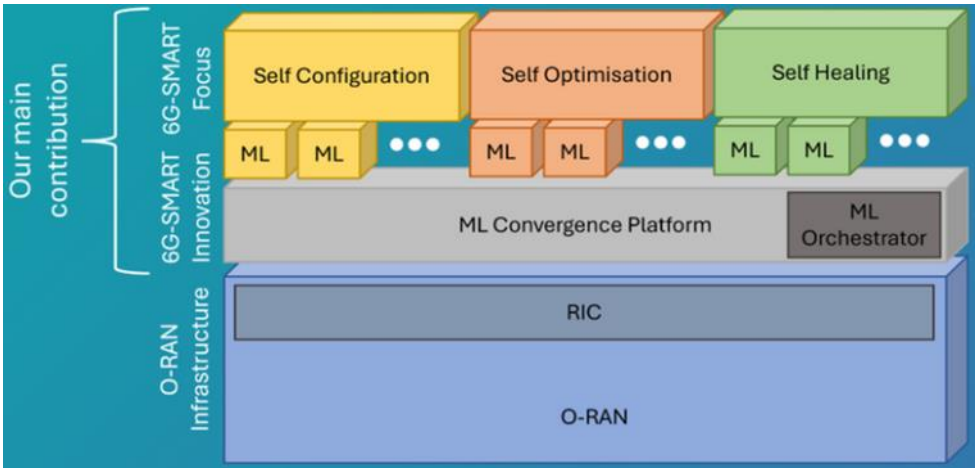

Figure 1: 6G-SMART scope, components, and architecture

To address the challenge of conflicting decisions among multiple ML models, the project will develop an innovative ML orchestrator. This orchestrator acts as a supervisory ML layer that learns the behaviour of individual models and ensures harmonised decision-making, ultimately enhancing network robustness and stability.

All models will be integrated into a unified ML Convergence (MLC) platform, which provides middleware abstraction, standardised APIs, and CI/CD support. This platform enables "build-once-deploy-anywhere" flexibility and ensures vendor-agnostic deployment across various O-RAN infrastructures.

Field testing will be carried out in the UK and Türkiye, targeting both telecom and industrial smart factory use cases. These real-world deployments will validate the feasibility and scalability of the developed system. The consortium combines academic research expertise with strong industrial experience, ensuring that the project outcomes are not only innovative but also practically applicable.

Through this multi-phase approach, 6G-SMART will contribute significantly to the advancement of AI-driven, self-organising mobile networks, aligned with the broader vision of 6G.

Main results

The primary outcome of 6G-SMART is the development of a robust middleware platform—the ML Convergence (MLC) platform—that can host and orchestrate multiple AI/ML models for network automation in Open RAN. This platform will support modular integration of third-party xApps and rApps, enabling network operators to automate key functions such as configuration, optimisation, and fault management.

Three distinct AI/ML solutions will be developed for self-configuration (led by FC), self-optimisation (led by UOS), and self-healing (led by ISEP), and will be harmonised by the ML orchestrator to work together without conflicts. These solutions will be validated in diverse environments, including telecom networks and industrial settings.

In addition to technical results, the project will generate open research outputs, datasets, and reference implementations to support the wider community. The results will significantly lower the barrier to deploying intelligent, adaptable 6G networks.

Impact

6G-SMART aims to revolutionise mobile network management by enabling large-scale automation through coordinated AI/ML. Its orchestration platform resolves ML integration challenges, reducing operational costs and boosting performance. The project supports Europe's role in the O-RAN ecosystem and provides SMEs with an open platform to deploy AI-driven telecom innovations.

The project can have impact on the **WG1**, **WG2**, and **WG3** specifications of **ORAN Alliance** such as O-RAN Architecture Description, O-RAN Non-RT RIC: Architecture**,** O-RAN Near-RT RIC Architecture, and O-RAN Near-RT RIC APIs specification. The impact will be on the ORAN architecture, specifically RIC, by adding MLC and its procedures to the existing architecture.

The 6G-SMART project directly supports the O-RAN Alliance's vision of enabling **third-party innovation and IPR injection** into vendor-neutral RAN systems. The core contribution of our project is the development of an **open, pluggable ML convergence (MLC) platform** that allows third-party AI developers to deploy AI-based xApps in a harmonised, scalable, and simpler manner.

About CELTIC-NEXT

CELTIC-NEXT is the EUREKA Cluster for next-generation communications enabling the digital society. CELTIC-NEXT stimulates and orchestrates international collaborative projects in the Information and Communications Technology (ICT) domain.

The CELTIC-NEXT programme includes a wide scope of ICT topics based on new high-performance communications networks supporting data-rich applications and advanced services, both in the ICT sector and across all vertical sectors.

CELTIC-NEXT is an industry-driven initiative, involving all the major ICT industry players as well as many SMEs, service providers, and research institutions. The CELTIC-NEXT activities are open to all organisations that share the CELTIC-NEXT vision of an inclusive digital society and are willing to collaborate to their own benefit, aligned with their national priorities, to advance the development and uptake of advanced ICT solutions.

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